CLAIMS:

1. An isolated, soluble, stabilized phycobilisome comprising a plurality of phycobiliproteins specifically connected by at least one linker polypeptide.

2. The stabilized phycobilisome of claim 1, wherein said phycobilisome comprises at least one rod.

3. The stabilized phycobilisome of claim 1, wherein said phycobilisome comprises a core complex and no peripheral rods.

4. The stabilized phycobilisome of claim 1, wherein said phycobilisome comprises a core complex and at least one disc.

5. The stabilized phycobilisome of claim 1, wherein said phycobilisome comprises an anchor protein.

6. The stabilized phycobilisome of claim 1, wherein said phycobilisome comprises at least one protein encoded by each of at least two different algal strains.

7. The stabilized phycobilisome of claim 1, wherein the phycobilisome is reconstituted from a mixture comprising an isolated phycobiliprotein or an isolated linker polypeptide.

8. The stabilized phycobilisome of claim 1, wherein said phycobilisome has been modified by covalent attachment of desired chemical moieties.

9. The stabilized phycobilisome of claim 8, wherein said chemical moieties are attached to a particular portion of the phycobilisome.

10. The isolated, stabilized phycobilisome of claim 1, wherein the phycobilisome is functionally coupled to a signal-generating system.

11. A phycobilisome conjugate comprising a phycobilisome conjugated to a molecular species selected from the group consisting of ligands, receptors, and signal-generating molecules, wherein each phycobilisome comprises a plurality of phycobiliproteins specifically connected by at least one linker polypeptide, said molecular species being attached to a single type of phycobiliprotein, a single type of linker polypeptide, or an anchor protein.

12. The phycobilisome conjugate of claim 11, wherein the molecular species selected from the group consisting of ligands, receptors, and signal-generating molecules is attached to one type of phycobiliprotein.

13. The phycobilisome conjugate of claim 11, wherein the molecular species selected from the group consisting of ligands, receptors, and signal-generating molecules is attached to one type of linker polypeptide.

14. The phycobilisome conjugate of claim 11, wherein the molecular species selected from the group consisting of ligands, receptors, and signal-generating molecules is attached to an anchor protein.

15. A phycobilisome conjugate comprising a phycobilisome conjugated to a molecular species selected from the group consisting of ligands, receptors, and signal-generating molecules, wherein each phycobilisome comprises a plurality of phycobiliproteins specifically connected by at least one linker polypeptide, said molecular species being attached to a particular portion of said phycobilisome.

16. The phycobilisome conjugate of claim 11 or claim 15, wherein the phycobilisome is an isolated phycobilisome.

17. The phycobilisome conjugate of claim 11 or claim 15, wherein the phycobilisome is stabilized.

18. The phycobilisome conjugate of claim 11 or claim 15, wherein said phycobilisome comprises at least one protein encoded by each of at least two different algal strains.

19. The phycobilisome conjugate of claim 11 or claim 15, wherein said phycobilisome is reconstituted from a mixture comprising an isolated phycobiliprotein or an isolated linker protein.

20. The phycobilisome conjugate of claim 11 or claim 15, wherein the phycobilisome is functionally coupled to a signal-generating system.

21. The phycobilisome conjugate of claim 11 or claim 15, wherein the molecular species is selected from the group consisting of streptavidin, avidin, an antibody, a hapten, biotin, a drug, an antigen, a nucleic acid, a carbohydrate, and a lectin.

22. An isolated phycobilisome comprising a plurality of phycobiliproteins specifically connected by at least one linker polypeptide, said phycobilisome being non-covalently attached to a molecular species selected from the group consisting of ligands, receptors, and signal-generating molecules, wherein the molecular species is not an antibody which specifically binds said phycobilisome.

23. The isolated phycobilisome of claim 22, wherein the phycobilisome is stabilized.

24. The isolated phycobilisome of claim 22, wherein the attachment between the phycobilisome and the molecular species comprises biotin.

25. The isolated phycobilisome of claim 22, wherein the molecular species is attached to a single type of phycobiliprotein, a single type of linker polypeptide, or an anchor protein.

26. The isolated phycobilisome of claim 22, wherein the molecular species is attached to a particular portion of said phycobilisome.

27. The isolated phycobilisome of claim 22, wherein the phycobilisome is functionally coupled to a signal-generating system.

28. The isolated phycobilisome of claim 22, wherein the phycobilisome comprises at least one protein encoded by each of at least two different algal strains.

29. The isolated phycobilisome of claim 22, wherein the phycobilisome is reconstituted from a mixture comprising an isolated phycobiliprotein or an isolated linker protein.

30. The isolated phycobilisome of claim 22, wherein the phycobilisome is immobilized on a manufactured solid support.

31. An isolated, functionally intact phycobilisome comprising a plurality of phycobiliproteins specifically connected by at least one linker polypeptide, wherein said phycobilisome is immobilized on a manufactured solid support.

32. The immobilized phycobilisome of claim 31, wherein the phycobilisome is stabilized.

33. The immobilized phycobilisome of claim 31, wherein the phycobilisome is covalently attached to a molecular species selected from the group consisting of ligands, receptors, and signal-generating molecules.

34. The immobilized phycobilisome of claim 33, wherein said molecular species is attached to one type of constituent phycobilisome protein.

35. The immobilized phycobilisome of claim 33, wherein the molecular species is attached to a particular portion of the phycobilisome.

36. The immobilized phycobilisome of claim 31, wherein said phycobilisome comprises at least one protein encoded by each of at least two different algal strains.

37. The immobilized phycobilisome of claim 31, wherein said phycobilisome is reconstituted from a mixture comprising an isolated phycobiliprotein or an isolated linker polypeptide.

38. The immobilized phycobilisome of claim 31, wherein the phycobilisome is functionally coupled to a signal-generating system.

39. The immobilized phycobilisome of claim 31, wherein the phycobilisome is a functional component of a biotransducer.

40. The immobilized phycobilisome of claim 31, wherein the solid support is selected from the group consisting of a synthetic membrane, a polymer, a microparticle, silicon, and glass.

41. A manufactured solid support containing a plurality of immobilized phycobilisomes according to claim 31, said phycobilisomes being immobilized on the solid support in a structurally ordered arrangement thereby forming a pattern on the solid support.

42. A manufactured solid support containing a plurality of immobilized phycobilisomes according to claim 31, each phycobilisome being immobilized on the solid support in the same orientation with respect to the solid support.

43. An input system for a transducer comprising:

conversion means for receiving ultraviolet or visible light and directionally transferring light energy of said light; and

coupling means for receiving said directionally transferred light energy and delivering said light energy to a transducer.

44. The system of claim 43, wherein said coupling means comprises an optical fiber.

45. The system of claim 43, wherein said coupling means comprises a waveguide.

46. ~~The system of claim 43~~, wherein said conversion means comprises a phycobilisome.

47. An environmentally responsive optical sensor, comprising:

conversion means for receiving ultraviolet or visible light and directionally transferring light energy of said light, wherein transfer of the light energy is dependent on an environmental condition; and

sensor means for receiving said directionally transferred light energy and producing an indication of the environmental condition.

48. The environmentally responsive optical sensor of claim 47, wherein said directionally transferred light energy comprises a photon of a particular energy level, said energy level being dependent upon said environmental condition.

49. The environmentally responsive optical sensor of claim ~~47,~~ wherein said conversion means comprises a phycobilisome.

~~50. A system for processing a light signal comprising:~~

conversion means for receiving ultraviolet or visible light and directionally transferring light energy of said light; and

processing means for receiving and processing said directionally transferred light energy.

51. The system of claim 50, wherein said processing means comprises an optical fiber operative to transmit said light signal.

52. The system of claim 50, wherein said processing means comprises a photosensor.

53. The system of claim 50, wherein said directionally transferred light energy comprises a photon.

54. The system of claim 50, wherein said conversion means comprises a phycobilisome.

55. A method for performing a specific binding assay comprising:

contacting a sample comprising an analyte with a specific binding partner;

determining the amount of the analyte present in the sample by means of its ability to specifically bind to the specific binding partner, wherein a component of the assay is detectably labeled with a signal-generating system comprising phycobilisomes, said phycobilisomes being self-assembling complexes of phycobiliproteins and linker proteins, each phycobilisome comprising at least one rod, said assay component being selected from the group consisting of the specific binding partner, reagent molecules having the same chemical identity as the analyte, and reagent molecules which compete with the analyte for specific binding to the specific binding partner.

56. The method of claim 55, wherein an assay component selected from the group consisting of a specific binding partner, a reagent molecule having the same chemical identity as the analyte, and a reagent molecule which competes with the analyte for specific binding to the specific binding partner is attached to a solid phase.

57. The method of claim 56, wherein the solid phase is selected from the group consisting of a synthetic membrane, a polymer, a microparticle, silicon, and glass.

58. The method of claim 55, wherein the analyte is selected from the group consisting of a nucleic acid, a drug, a ligand, an antigen, a hapten, an antibody, and a carbohydrate.